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Forest Health Protection
Pacific Southwest Region

Date: August 15, 2011
File Code: 3420

To: District Ranger, Feather River Ranger District, Plumas National Forest

Subject: Insect and Disease Evaluation of Silvicultural Certification Unit 49, Concow Fuels Reduction Project (FHP Report NE11-11)

At the request of Judy Welles, Silviculturist, Feather River Ranger District, I conducted a field evaluation of her new silvicultural certification stand (Unit 49) near Paradise Lake on August 10, 2011. The objectives were to evaluate the current forest health conditions within the stand, discuss what influence these conditions would have on stand management objectives and provide recommendations as appropriate. This evaluation supplements FHP Report NE11-07 reflecting the change in the location of the silvicultural certification stand. Discussions of prescribed fire and special considerations for sugar pine from the previous report apply to this stand but were excluded from this document. Judy accompanied me to the field.

Site information

The Concow Fuels Reduction Project (CFRP) consists of Forest Service owned parcels between Paradise Lake and Concow Reservoir (39° 48.5644"N and 121° 32.9000"W). Elevations range from 2,500 to 3,300 feet with annual precipitation between 60 and 70 inches. Forest cover varies with elevation and aspect and between parcels. Most stands are comprised of Sierra Nevada mixed conifer and hardwood with differing percentages of the following species; ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), Douglas-fir (*Psuedotsuga menziesii*), incense cedar (*Calocedrus decurrens*), white fir (*Abies concolor*), Jeffrey pine (*Pinus jeffreyi*), black oak (*Quercus kelloggii*) and tanoak (*Lithocarpus densiflorus*). Management objectives for the CFRP are to create defensible fuel profile zones (DFPZs) along road corridors and next to communities

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by removing surface and ladder fuels, reducing stocking levels and improving desirable species composition to create more resilient stand conditions. Areas within the Concow Fire will focus on dead tree removal, course woody fuel reduction and reforestation.

Figure 1. Dead and down ponderosa pine from previous western pine beetle attacks.

<u>**Forest insect and disease conditions**</u>

<u>Unit 49</u>

Insect and/or disease caused tree mortality is occurring at a very low level in this stand with the exception of western pine beetle (*Dendroctonus brevicomis*) caused mortality of ponderosa pine. A few small groups (~3 - 8 trees/group) of large diameter ponderosa pine were killed by western pine beetle several years ago. These pockets now contain a few snags and several down logs (Figure 1). One green ponderosa pine near this area was observed with fresh attacks as evidenced by pitch tubes and frass. Other observed agents present but not of particular concern were:

- Red ring rot (*Phellinus pini*) - found on the boles of a few Douglas-fir and ponderosa pine throughout the stand.
- Diplodia blight (*Sphaeropsis sapinea*) – observed on a couple of ponderosa pines along the irrigation ditch.
- Red turpentine beetle (*Dendroctonus valens*) – found on a few ponderosa pines growing in close proximity to western pine beetle attacked trees (Figure 2).

The stand is stocked at basal areas ranging between 350 and 400 sq.ft./acre.

Figure 2. "Pitch tubes" on ponderosa pine caused by red turpentine beetle attacks.

<u>**Considerations for thinning**</u>

Prescriptions that meet the requirements of a DFPZ should also be consistent with past direction from the Regional Forester to thin to "ensure that density does not exceed an upper limit (for example: 90% of normal basal area, or 60% of maximum stand density index)" and to "design thinnings to ensure that this level will not be reached again for at least 20 years after thinning." (Regional Forester letter, "Conifer Forest Density Management for Multiple Objectives", July 14, 2004). Reducing stocking levels to this range should effectively reduce inter-tree competition for limited water and nutrients and reduce the risk of insect and disease caused mortality.

The proposed treatment alternative aims to reduce stocking to approximately 220 sq.ft./acre, with some variability within the stand, through a general thinning combined with radial release of large conifers (three largest per acre) and black oak (up to five >6" dbh per acre). The target basal area will be determined mostly by the 40% canopy closure requirement but should still be low enough to reduce the risk of bark beetle caused mortality.

Ponderosa pine growing in this stand is at a much higher risk to bark beetle caused mortality than the other conifers due to its higher density and clumpy distribution. There is also a history of western pine beetle activity here that resulted in group kills of large diameter trees. Therefore, ponderosa pine should be given special consideration when planning thinning treatments to reduce its susceptibility to successful western pine beetle attacks. Risk could be decreased by reducing density to lower levels in ponderosa pine dominated pockets (<150 sq.ft./acre) than what is appropriate for surrounding mixed conifer stands and/or by removing more ponderosa pines from these pockets in favor of retaining other tree species to increase diversity. Sufficiently lowering the basal area in pine dominated pockets will likely reduce their canopy cover to below required thresholds. However, more basal area, and higher canopy cover, could be retained in adjacent mixed conifer areas in order to maintain an average of 40% canopy cover throughout the entire stand.

Lowering density in these pockets will not only increase the health and vigor of individual trees but may serve to change the microclimate, creating a less favorable environment for bark beetle pheromone communication. Opening up the canopy creates convection currents and air turbulence through increases in soil temperature as well as increasing wind speed (Bartos and Amman 1989, Amman and Logan 1998). This prevents bark beetle pheromone plumes from concentrating under the canopy and remaining in close proximity to individual trees or groups of trees.

It is recommended that a registered borate compound be applied to all freshly cut conifer stumps >14" dbh to reduce the chance of creating new infection centers of *Heterobasidion irregulare* (formerly 'P'-type annosus root disease) and *H. occidentale* (formerly 'S'-type annosus root disease) within the unit. Although no signs of heterobasidion root disease were observed and root disease is not typically a problem in this area, higher use of this stand by the local public creates a situation where minimizing the number of hazard trees becomes more important. Treating stumps will reduce the chance of creating new infection centers that could lead to the creation of future hazard trees.

If you have any questions regarding this report and/or need additional information please contact me at 530-252-6431 or dcluck@fs.fed.us.

/s/ Danny Cluck

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Insect and Disease Information

Red Ring Rot

Red ring rot, also called white pocket rot, is caused by a wood decay fungus, *Phellinus* (*Fomes*) *pini*, that attacks Douglas-firs, pines, true firs, hemlock, and rarely incense-cedar. It occurs throughout the coniferous forests of the world, and is the single most damaging heart rot organism in the West.

Red ring rot attacks young-growth as well as old-growth trees. It usually infects through branch stubs, and rarely through open wounds. Thus, this fungus may cause serious heart rot problems in managed stands of the future.

The perennial, woody fruiting bodies or conks that arise from the branch stubs or knots of living trees are the best indicators of decay. Sometimes only punky knots bearing the inner portion of the fruiting body remain on the stem. These punky knots may later be overgrown by new wood, becoming swollen knots that are the only symptom of decay. When conks or swollen knots are present, assume that advanced decay extends about 3-5 feet above and 5-7 feet below the indicator. If conks or swollen knots are visible along much of the stem, heart rot will be extensive.

Western Pine Beetle

Hosts: Ponderosa pine and Coulter pine

Distribution in California: Throughout the range of suitable host trees.

Identification: Smallest of the western *Dendroctonus* species, this black cylindrical beetle is about the size of a grain of rice (4 mm long). Egg galleries are winding and packed with frass. Larval galleries lead away from the main gallery for short distances before turning into the outer bark. Small, reddish pitch tubes (sometimes fairly obscure) are signs of successful attack. Attacked trees often exhibit woodpecker feeding with only portions of the outer bark removed. Sapwood of infested trees usually shows evidence of the characteristic bluestain associated with fungi introduced by attacking beetles.

Effects: Successful attacks result in death of the host tree. Groups of trees are sometimes killed, especially when growing under crowded conditions. Since larger trees are generally preferred, the western pine beetle can dramatically alter the character of a forest that comes under attack.

Ecological Role: The western pine beetle serves as a key mortality agent for ponderosa pines weakened by the effects of old age, drought, smog, diseases, or competition with other trees. Stand structure can be altered and gaps can be created in the stand as the bark beetles kill larger trees, either singly or in groups. In those instances where ponderosa pine occurs in mixed stands with firs, the western pine beetle can accelerate the successional process by selectively removing the early seral species from the stand. Trees infested by the western pine beetle provide temporary food sources for woodpeckers and other insectivores. Infestation by western pine beetle sets the stage for other agents, such as wood borers and decay fungi that are involved in the recycling of nutrients back into the soil.

Life History: In the northern part of its range and at higher elevations, the western pine beetle completes two generations in one year, with adult beetles flying in early to mid June and mid to

late August. In the southern part of its range and at lower elevations, the beetles produce three and sometimes four generations per year. Attacks may be as early as March and as late as November. Female beetles locate a suitable host and initiate attacks by burrowing through the bark. They release a pheromone that attracts other beetles and leads to mass attacks of the host tree and sometimes several trees in a group. Each female lays about 60 eggs in individual niches cut in the sides of the egg gallery. These eggs hatch in two weeks and young larvae feed initially in the phloem, later moving into the outer bark where most of their development takes place. After four larval stages, the insects turn into pupae and then adults.

Conducive Habitats: The western pine beetle breeds most commonly in trees of reduced vigor. While older, larger trees are generally preferred, younger trees can also be infested, especially when they occur in dense stands, are infected by pathogens, or are damaged by fire. During periods of drought, the western pine beetle will be particularly prominent and can overcome apparently healthy trees.

Similar Insects: Other bark beetles attacking ponderosa pine may be distinguished from western pine beetle by their egg gallery characteristics and adult appearance. Egg galleries of the mountain pine beetle are straight and vertical, and those of the engraver beetles possess a nuptial chamber with one to several tunnels radiating out from it. Engraver beetle egg galleries are free of frass. Ips adults display a pronounced concavity at the rear end of the elytra that possesses three to six spines on either side. The elytral declivity on *Dendroctonus* adults is rounded and does not possess any spines.

Management Strategies: The detrimental effects of western pine beetle can best be minimized by providing vigorous growing conditions for host trees. Stand densities below the “Upper Management Zone” (Cochran 1992; Cochran et al 1994) will provide sufficient growing space for trees and will minimize potential habitat for the western pine beetle. *Dendroctonus* beetle group-kills cause a limiting Stand Density Index of 365 that differs little between stands on good and poor sites in California (Oliver 1995). In the past, “high-risk” trees (those most likely to be infested by the western pine beetle) were identified by various hazard rating systems (Keen 1936; Salman and Bongberg 1942; Smith et al. 1981) and removed. Short-term treatments are also available to protect individual, high value trees such as spraying insecticides on tree boles to prevent bark beetle attacks. Other short-term treatment options for individual trees are currently being evaluated such as the use of anti-aggregation pheromones and non-host angiosperm volatiles. Tree injection systems are being explored to treat trees with systemic insecticides.

Red Turpentine Beetle

The red turpentine beetle, *Dendroctonus valens*, occurs throughout California and can breed in all species of pines. It normally attacks injured, weakened or dying trees and freshly cut stumps. The adults are attracted by fresh pine resin. They often attack wounded trees in campgrounds or following logging, trees scorched by wildfire or prescribed burns, lightning-struck trees and root-diseased trees exhibiting resinosis.

Attacks usually occur at the soil line or root crown and are characterized by a large reddish pitch tube at the point of entry. On severely stressed trees or during periods of drought, attacks may occur underground on the main roots up to 15 feet from the bole and also on the bole to a height of 10 feet. If an attack is successful, the adults excavate an irregular gallery in the cambium and the female lays eggs along the sides. The larvae feed in a mass and destroy an area of cambium ranging from 0.1 to 1.0 square feet.

Attacks do not always kill trees but may predispose them to attack by other bark beetles. Repeated or extensive attacks by the red turpentine beetle can kill pines.

Attacks occur throughout warm weather and peak at mid-summer. The number of generations varies from two years for a single generation at the coldest portions of its range to two or three per year in the warmest.

Attacks can be minimized or prevented by avoiding soil compaction and injury to standing trees during logging or construction and also by insecticide application to high value trees.